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RELIABILITY TEST PLAN

AND PROCEDURES FOR

C-4453/APQ-10. AND C-6410/APQ-109

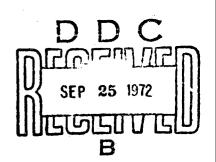
RADAR INDICATOR CONTROL UNITS

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SERVICE ENGINEERING DIVISION

OGDEN AIR MATERIEL AREA HILL AFB, UTAH 84401





#### RELIABILITY ENGINEERING

TEST PLAN

June 1972

Prepared By
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#### RELIABILITY TEST PLAN

## AND PROCEDURES FOR

C-4453/APQ-100 AND C-5410/APQ-109 INDICATOR CONTROL UNITS

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#### **ABSTRACT**

This document presents the requirements, definitions, and methods necessary to demonstrate the reliability of the C-4453/APQ-100 and C-6410/APQ-109 Rador Indicator Control Units (ICUs). This test is in support of the Rivet Haste II program and an essential part of the F-4 fire control systems Increased Reliability of Operational Systems (IROS) program.

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# TP-MMER/RM-72-108

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#### 1.0 INTRODUCTION

#### 1.1 GENERAL

This test plan specifies the reliability demonstration test to be conducted on the C-4453/APQ-100 Radar Indicator Control Unit (ICU) as part of the Rivet Haste II program and the F-4 fire control system Increased Reliability of Operational Systems (IROS) program. Due to the similarity between the C-4453 and C-6410/APQ-109 ICUs, and since the proposed modification is the same for both units, only the C-4453 ICU will be tested.

#### 1.2 PURPOSE OF TEST

The purpose of the testing is to establish reliability parameters for determining the relative improvement between baseline configured (unmodified) C-4453 ICUs and ICUs incorporating the modifications outlined in OOAMA Service Engineering Report TR-MMER/RM-72-102, Operating the DOD with Less Money and Less Manpower. Testing of both the unmodified and modified units will be in accordance with MIL-STD-781B, Test Level E.

#### 1.3 APPLICABLE DOCUMENTS

The following documents, of the exact issue shown, form a part of this test plan to the extent specified herein.

MIL-STD-781B Reliability Tests: Exponential Distribution

Notice 1 dated 15 November 1967

MIL-STD-721B Definitions of Effectiveness Terms for Relia-

bility, Maintainability, Human Factors, and

Safety

Notice 1 dated 10 March 1970

T.O. 12P2-2APQ100-2-4 Field Maintenance Instructions - Radar Set,

Type AN/APQ-100, Vol. IV (Westinghouse)-F4C

Change 7, dated February 1, 1972.

T.O. 33D5-12-172-1 Operator and Service Instructions with IPB Indicator and Indicator Control Test Station,
P/N 461R507G01 (Westinghouse) (Conf-Gp 3)
Change, dated 1 June 1969

T-7120605 Inspection Test Procedures for Indicator Control and Semi-Composite of Indicator System for

AN/APQ-100 (Westinghouse)

Revision J, dated 6 January 1965

T-712603 Inspection Test Procedure for B-Gun Circuitry

for AN/APQ-100 Indicator Control (Westinghouse)

Revision H, dated 15 June 1965

T-712602 Inspection Test Procedure for A-Gun Circuitry for

AN/APQ-100 Indicator Control (Westinghouse)

Revision H dated 18 June 1965

#### 1.3.1 PRECEDENCE OF DOCUMENTS

In the case of conflict between requirements of this test plan and those contained in the applicable documents, the order of precedence shall be as follows:

- a. This Test Plan
- b. MIL-STD-781B
- c. MIL-STD-721B
- d. T-7120605
- e. T.O. 33D5-12-172-1
- f. T-712603
- g. T-712602
- h. T.O. 12P2-2APQ190-2-4

#### 2.0 GFNERAL TEST REQUIREMENTS

#### 2.1 QUANTITY OF TEST SPECIMENS

Three (3) unmodified (baseline) ICUs and four (4) ICUs incorporating the proposed modification.

#### 2.2 TEST LEVEL

Modified Test Level E of MIL-STD-781B shall be used during the testing. The conditions of the modified test level are as follows.

- (1) Temperature . . . .  $-54^{\circ}$ C to  $+55^{\circ}$ C ( $-65^{\circ}$ F to  $+131^{\circ}$ F)
- (2) Temperature Cycling . . . . Temperature Cycling shall be time to stabilize at low temperature, followed by time to stabilize at high temperature, plus 2 hours. See Figure 1 for more detail.
- (3) Vibration . . . . 2.2G ± 10% peak acceleration value at any nonresonant frequency between 20 and 60 Hz measured at the mounting points on the equipment. The duration of vibration shall be least 10 minutes during each hour of operating time. See Figure 1 for more detail.
- (4) Equipment On-Off Cycling . . . . Equipment off during portion of cooling cycle from room ambient temperature (80°F) until stabilized lower temperature limit is reached. Equipment on during heating cycle, plus 2 hours operation at stabilized high temperature limit, plus portion of cooling cycle down to room ambient temperature. See Figure 1 for more detail.
- (5) Input Voltage . . . . Nominal specified voltage, ±5%
- (6) Input Voltage Cycling . . . . Not required.

# 2.3 TEST CRITERIA

The accept and reject criteria for this test were constructed utilizing the statistical properties of the F-distribution. That is, the times-to-failure of both the modified and unmodified units are assumed to follow a negative exponential probability distribution, which is the expected distribution based on past history of complex electronic equipment such as the test units. Based on this assumption, the respective MTBF's of the modified and unmodified units will be Chi-Square distributed. The ratio of two Chi-Square variables, when each is divided by its associated number of degrees of freedom, is F-distributed. Therefore, it can be shown that the ratio of the MTBF's of the modified and unmodified units is F-distributed. The details of this derivation can be found in OOAMA Service Engineering Technical Report TR-MMER/RM-72-110 (to be published).

Utilizing the above theory, critical values were determined for the combination of relevant failures and operating times on the modified and unmodified units required to demonstrate the desired improvement factor. The critical values for the accept criteria are based on demonstrating an improvement factor of 3.6 or greater for the ICU's. The critical values for the reject criteria are based on demonstrating an improvement factor of 3.0 or less for the ICU's. Both the accept and reject criteria are based on a confidence level of 90%.

The optimum test truncation time was determined to be one thousand (1000) accumulative operating hours on both the modified and unmodified units. This was determined by utilizing the Poisson distribution and comparing the probability of making an accept/reject decision with test time.

Based on this time truncation point, the failure truncation point was determined to be ten (10) failures on the modified units. Test trun tion on failures of the unmodified units is not applicable since it depends strictly on the number of failures on the modified units.

A summary of the quantitative requirements of the test criteria is given in Table 1. The accept and reject criteria are given in Tables 2 and 3 respectively.

#### TABLE I

#### SUMMARY OF TEST REQUIREMENTS

 $D_0$  = Minimum accept improvement factor = 3.6

 $D_1$  = Maximum reject improvement factor = 3.0

Confidence Level = 90%

Test Truncation Time = 1000 operating hours (on modified and on unmodified units)

Test Failure Truncation = ten failures on modified units

#### 2.4 TEST CYCLE

The test cycle is depicted in Figure 1 and will consist of the following.

- (1) With the test specimens non-operating, the test specimen temperature will be reduced to -65°F and maintained until specimen stabilization is reached. The stabilization time is derived from the thermal survey.
- (2) Following specimen stabilization, the specimens will be switched on and allowed to warm-up for five (5) minutes. The specimen temperature will then be increased to +131°F.

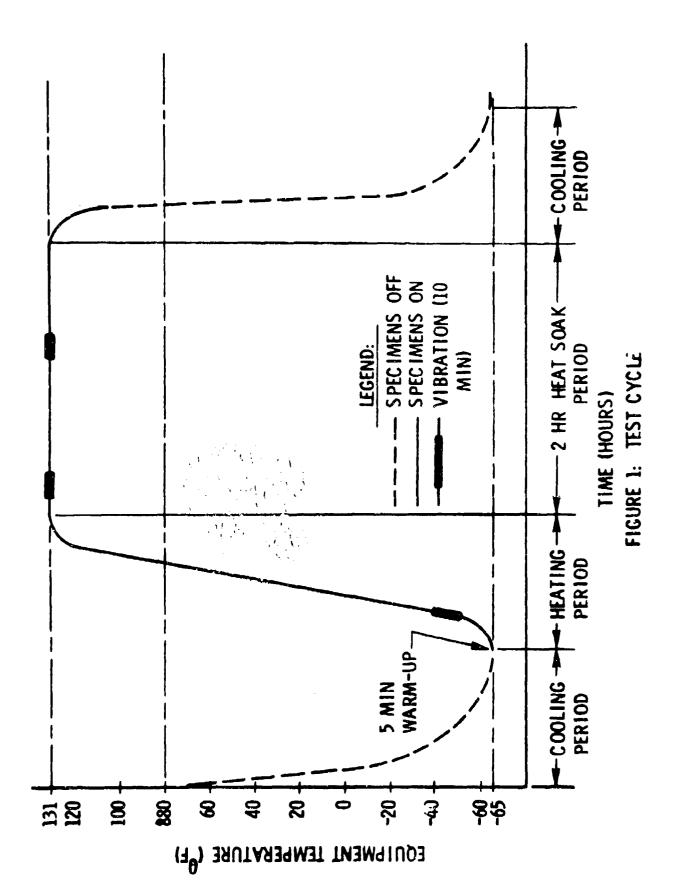
- (3) Application of vibration at the 2.2G ± 10% level, and at the frequency determined in the vibration survey, will be applied to the specimens for ten (10) minutes of each operating nour, beginning with the first hour of operation.
- (4) When the specimens have reached +131°F, and have stabilized as determined by the thermal survey, they shall be operated an additional two (2) hours.
- (5) Following the two (2) hour operating period, the specimens will be decreased to +80°F at which point the test specimens will be turned off. The specimen temperature will then be decreased to -65°F for start of the next cycle.

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18.82 3.90 1.97 1.25 320 .717 .633 .347 463  25.14 5.15 2.24 1.44 1.06 .870 .817 .077 .657 .350  25.14 5.15 2.84 1.44 1.06 .870 .877 .657 .350  28.37 5.78 2.86 1.83 1.33 1.03 .910 .787 .653  31.47 6.40 3.17 2.02 1.47 1.13 1.00 .867 .730  31.40 3.16 2.40 1.74 1.36 1.09 .867 .730  37.80 7.66 3.17 2.02 1.47 1.13 1.00 .867 .730  37.80 7.66 2.29 1.34 2.20 1.47 1.13 1.00 .867 .730  44.13 8.92 4.06 2.59 1.88 1.47 1.10 1.12 .937  44.13 8.92 4.36 2.78 2.02 1.59 1.39 1.20 1.07  44.13 8.92 4.36 2.78 2.02 1.50 1.03 1.10 1.10 1.08  55.80 11.42 5.57 3.16 2.40 1.67 1.44 1.21  55.80 11.42 5.57 3.16 2.40 1.67 1.44 1.21  56.80 11.42 5.57 3.36 2.43 1.80 1.67 1.44 1.21  56.80 11.42 5.57 3.75 2.61 1.90 1.67 1.44 1.21  56.80 11.42 5.57 3.75 2.61 1.90 1.67 1.44 1.54  56.29 13.30 6.48 4.13 2.98 2.61 1.94 1.68 1.41  66.29 13.30 6.48 4.13 2.98 2.21 1.94 1.68  182.07 16.46 7.99 5.09 3.57 2.83 2.14 1.94  182.07 16.46 7.99 5.09 3.57 2.83 2.14 2.70 1.71  82.07 16.46 7.99 5.89 3.81 2.95 2.51 1.91  82.07 16.46 7.99 5.89 3.81 2.95 2.51 2.31 1.94  183.09 1.70 8.60 5.40 3.30 2.63 2.31 1.94  184.30 1.70 8.60 5.40 3.16 2.78 2.70 2.13 1.94  185.30 1.70 8.60 5.40 3.16 2.78 2.70 2.13 1.94  188.39 1.70 8.60 5.40 3.16 2.78 2.70 2.71 2.08  88.39 1.70 8.60 5.40 3.10 2.70 2.70 2.71 2.00  94.70 18.99 5.80 5.80 3.81 2.95 2.50 2.23 1.94  1.5 = Failures on modified  1.7 = Time on unmodified  1.7 = Failures on unmodified	18.82 21.98 25.14 28.37 31.47 31.63 37.80 40.97 44.13 47.30 50.47 50.47		<del>┡╸╏╶┩╸╃</del> ╸╃	<del>┡╸╏╺┩╸┪╶┩╶┩</del> ╍ <del>┩╸┩╺┡╺╋</del> ╌	1.06 1.19 1.33 1.47 1.61 1.88 2.02 2.02 2.16	.717 .826 .927 1.03 1.13 1.36 1.47	.633 .727 .817 .910 1.00 1.10 1.20 1.30	. 547 . 627 . 787 . 787 . 950 . 950 . 1.03	. 530 . 537 . 663 . 730 . 800	.487 .487 .543 .543 .550 .700	
21.98 4.53 2.24 1.44 1.06 .820 .727 .627 .530  25.14 5.15 2.55 1.63 1.33 1.03 .817 .707 .597  25.14 5.15 2.55 1.63 1.33 1.00 .867 .787 .663  31.47 6.40 3.76 2.40 1.47 1.13 1.00 .867 .730  34.63 7.66 3.76 2.40 1.74 1.36 1.20 1.03 .867  44.03 8.29 4.06 2.59 1.88 1.47 1.30 1.12 .950 .800  44.03 8.29 4.06 2.59 1.88 1.47 1.30 1.12 1.01  47.30 9.55 4.67 2.98 2.16 1.70 1.49 1.29 1.08  50.47 10.17 4.97 3.17 2.30 1.80 1.58 1.36 1.14  50.47 10.17 4.97 3.17 2.30 1.80 1.58 1.36 1.14  50.49 11.42 5.87 3.17 2.30 1.80 1.56 1.34  60.29 11.42 5.87 3.74 2.70 2.11 1.84 1.60 1.34  60.49 97 12.04 5.87 3.74 2.70 2.11 1.84 1.60 1.34  60.49 12.04 5.87 3.74 2.70 2.11 1.84 1.60 1.34  60.49 12.04 5.87 3.74 2.70 2.11 1.84 1.60 1.34  60.52 13.93 6.48 4.33 2.98 2.32 1.99 1.68  60.52 13.93 6.48 4.33 2.98 2.22 1.91 1.91 1.61  75.76 15.20 7.39 4.70 3.39 2.63 2.31 1.99 1.68  85.23 17.08 8.00 3.55 4.08 3.16 2.78 2.31 1.94  88.39 17.70 8.60 5.47 3.99 3.05 2.69 2.31 1.94  88.39 17.70 8.60 5.47 3.99 3.05 2.68 2.31 1.94  91.54 18.3 8.90 5.66 4.08 3.16 2.78 2.39 2.01  88.39 17.70 8.60 5.47 3.99 3.05 2.89 2.89 2.89 3.16 2.78 2.39 2.01  88.39 17.70 8.60 5.47 3.99 3.05 2.89 2.89 2.89 3.16 2.78 2.39 2.01  88.39 17.70 8.60 5.47 3.99 3.05 2.89 2.89 2.89 3.16 2.78 2.39 2.01  88.39 17.70 8.60 5.47 3.99 3.05 2.89 2.89 2.89 3.16 2.78 2.39 2.01  88.39 17.70 8.60 5.47 3.99 3.05 2.89 2.89 2.89 3.16 2.78 2.39 2.01  88.39 17.70 8.60 5.47 3.99 3.05 2.89 2.89 2.89 3.16 2.78 2.39 2.01  88.39 17.70 8.60 5.47 3.99 3.05 2.89 2.89 2.89 3.16 2.78 2.39 2.01  88.39 17.70 8.60 5.47 3.99 3.05 2.89 2.89 2.89 3.16 2.78 2.39 2.01  88.39 17.70 8.60 5.47 3.99 3.05 2.89 2.89 3.16 2.78 2.39 2.01  88.39 17.70 8.60 5.47 3.99 3.09 3.05 2.89 3.16 2.78 2.29 2.21 1.94  89.30 17.70 8.60 5.47 3.99 3.09 3.00 3.00 3.00 3.00 3.00 3.00	21.98 25.14 28.37 31.47 31.63 37.80 40.97 44.13 47.30 50.47 50.47	1   1 1 1 1	<del>╏╺┩╺╅</del> ╍╂╍╃	╏═╂═╂═╂═╂═╂═╂═	1.06 1.19 1.33 1.47 1.61 1.88 2.02 2.02 2.16 2.16	.820 .927 1.03 1.13 1.36 1.47	.727 .817 .910 1.00 1.10 1.20 1.30	. 767 . 707 . 787 . 867 . 950 1 . 03	. 530 . 587 . 730 . 800	.433 .487 .543 .597 .650 .757	
25.14 5.15 2.55 1.63 1.19 .927 .817 .707 .597 28.37 5.78 2.86 1.63 1.13 1.03 .910 .787 .663 34.63 7.03 3.46 2.22 1.61 1.25 1.10 .950 .800 37.80 7.66 3.76 2.40 1.74 1.13 1.20 1.03 .867 40.97 8.29 4.36 2.59 1.88 1.47 1.13 1.20 1.03 .867 40.97 8.29 4.36 2.59 1.88 1.47 1.13 1.20 1.03 .867 40.97 8.29 4.36 2.78 2.02 1.59 1.39 1.20 1.07 40.97 8.29 4.36 2.78 2.02 1.59 1.39 1.20 1.07 5.047 10.11 4.97 3.17 2.30 1.80 1.58 1.36 1.14 1.21 5.047 10.11 4.97 3.17 2.30 1.80 1.58 1.36 1.14 1.21 5.047 10.11 4.97 3.17 2.30 1.80 1.57 1.10 1.94 1.21 5.047 10.11 4.97 3.17 2.30 2.11 1.90 1.68 1.47 6.29 11.26 6.18 3.93 2.84 2.21 1.94 1.60 1.34 6.20 1.34 6.20 1.37 6.18 1.30 6.48 4.13 2.98 2.32 2.04 1.06 1.47 6.20 1.34 6.31 1.20 6.48 4.13 2.98 2.32 2.04 1.06 1.47 6.20 1.34 6.31 1.20 6.48 4.13 2.98 2.25 2.01 1.94 1.09 1.68 1.47 6.20 1.34 6.38 1.30 6.48 4.13 2.95 2.63 2.31 1.94 1.61 1.61 1.61 1.61 1.61 1.61 1.61 1.6	25.14 28.37 31.47 34.63 37.80 40.97 44.13 44.13 50.47 50.47	1 1 1 1 1	<del>┡╺┋</del> ╌╃╾╀╍╂╌╃	<del>╒╏╶╏╶╏┈╏┈╏</del> ╾╏	1.19 1.33 1.61 1.61 1.88 2.02 2.02 2.16	. 927 1.03 1.13 1.25 1.36 1.47	.817 .910 1.00 1.10 1.30 1.39	. 707 . 787 . 867 . 950 1.03	. 597 . 663 . 800 . 867	. 597 . 597 . 650 . 760 . 757	
28.37 5.78 2.86 1.83 1.33 1.03 .910 .787 .663 31.47 6.40 3.17 2.02 1.47 1.13 1.00 .867 .730 34.63 7.06 3.76 2.40 1.74 1.35 1.10 .950 800 37.80 7.66 3.76 2.40 1.74 1.36 1.20 1.01 .950 40.97 8.29 4.06 2.59 1.83 1.47 1.10 1.12 .937 40.97 8.29 4.06 2.59 1.89 1.47 1.10 1.12 .937 44.13 8.92 4.06 2.59 1.89 1.47 1.10 1.12 .937 44.13 8.92 4.06 2.59 1.89 1.47 1.10 1.12 .937 44.13 8.92 4.06 2.59 2.02 1.59 1.39 1.20 1.08 50.63 10.08 5.27 3.36 2.43 1.90 1.67 1.49 1.21 50.80 11.42 5.57 3.36 2.43 1.90 1.67 1.44 1.21 50.80 11.42 5.57 3.36 2.43 2.01 1.76 1.52 1.27 50.80 11.42 5.57 3.35 2.57 2.01 1.76 1.52 1.27 50.80 11.42 5.57 3.36 2.44 2.70 2.11 1.94 1.60 1.34 69.97 12.04 5.87 3.74 2.70 2.11 1.94 1.60 1.34 69.97 12.04 5.87 3.74 2.70 2.11 1.94 1.60 1.34 69.45 13.93 6.48 4.13 2.98 2.22 1.91 1.01 75.76 15.27 2.99 5.99 3.99 2.63 2.31 1.99 1.68 88.39 17.70 8.50 5.47 3.95 2.63 2.78 2.31 1.99 91.54 18.33 8.90 5.56 4.08 3.16 2.78 2.39 2.01 91.54 18.33 8.90 5.67 3.95 2.95 2.99 2.99 91.54 18.33 8.90 5.67 3.95 2.95 2.99 2.99 91.54 18.31 8.90 5.85 4.22 2.91 2.91 2.91 94.70 18.99 9.20 5.95 4.20 3.10 0.0000000000000000000000000000000	28.37 31.47 34.63 37.80 40.97 44.13 47.30 50.47 53.63	1 1 1 1	<del>┝╺╂</del> ╾╇╾╂╍╃	<del>╎┤┪┥┩</del>	1.33 1.47 1.74 1.88 2.02 2.16 2.16	1.03 1.13 1.25 1.36 1.47 1.59	. 910 1.00 1.10 1.30 1.39	. 787 . 867 . 950 1.03 1.12	. 663 . 730 . 800 . 867	.543 .597 .650 .760 .	
31.47 6 4.0 3.17 2.02 1.47 1.13 1.00 .867 .730   34.63 7.03 3.46 2.22 1.61 1.25 1.10 .950 .800   30.60 7.66 3.76 2.59 1.81 1.47 1.30 1.12 .937   40.97 8.29 4.06 2.59 1.88 1.47 1.30 1.12 .937   40.97 8.29 4.06 2.59 1.89 1.49 1.20 1.07   40.90 1.12 8.29 4.36 2.78 2.02 1.59 1.39 1.20 1.07   40.90 1.142 5.57 3.56 2.43 1.90 1.67 1.49 1.21   50.47 10.17 4.97 3.17 2.02 1.80 1.67 1.41 1.21   50.49 11.42 5.57 3.56 2.57 2.01 1.76 1.52 1.27   49.97 12.06 5.87 3.76 2.57 2.01 1.76 1.52 1.27   60.29 13.36 6.48 4.32 2.84 2.21 1.94 1.60 1.34   60.29 13.36 6.48 4.32 3.12 2.24 2.13 1.99 1.68   60.29 13.93 6.48 4.32 3.12 2.24 2.13 1.99 1.68   72.60 14.57 7.09 4.51 3.26 2.53 2.01 1.99 1.68   72.60 14.57 7.09 4.51 3.26 2.53 2.01 1.99 1.68   72.50 14.57 7.09 4.51 3.26 2.53 2.11 1.99 1.68   72.50 14.57 7.09 4.51 3.26 2.53 2.11 1.99 1.68   72.50 19.54 7.9 8.50 3.55 2.57 2.11 2.95 2.23 1.91   82.37 17.08 8.30 5.28 3.81 2.95 2.59 2.21 1.94   94.70 18.99 9.20 5.67 3.95 4.22 3.10 0 unmodified $r_1^1$ = Failures on unmodified $r_2^1$ = Taime on unmodified $r_2^1$ = Failures on unmodified $r_2^1$ = Taime on unmodified $r_2^1$ = Failures on unmodified $r_2^1$ = Taime on unmodified $r_2^1$ = Failures on unmodified $r_2^1$ = Taime on unmodified $r_2^1$ = Failures on unmodified $r_2^1$ = Taime on unmodified $r_2^1$ = Failures on unmodified $r_2^1$ = Taime $r_2^1$	31.47 34.63 37.80 40.97 44.13 47.30 50.47 53.63	7.03	<del></del> <del></del> <del></del>	<del>├─<del>╽</del>┈╅╾╂╼╂┈╋</del> ┈	1.47 1.61 1.88 2.02 2.02 2.16 2.30	1.13 1.25 1.36 1.47	1.00 1.10 1.20 1.30	. 867 . 950 1.03 1.12	. 800 . 860 . 867	.597 .650 .700 .	
34.63       7.03       3.46       2.12       1.61       1.25       1.10       .950       .800         37.80       7.66       3.76       2.40       1.74       1.36       1.20       1.03       .867         44.13       8.92       4.06       2.59       2.02       1.59       1.20       1.07         44.13       8.92       4.67       2.98       2.16       1.70       1.49       1.20       1.07         47.30       9.55       4.67       2.98       2.16       1.70       1.49       1.20       1.07         50.47       10.17       4.97       3.17       2.30       1.80       1.26       1.14         50.47       10.10       4.97       3.17       2.30       1.80       1.80       1.14         50.47       10.10       4.97       3.17       2.30       1.80       1.80       1.14         50.47       10.10       4.97       3.17       2.30       1.80       1.80       1.14       1.10         50.47       10.10       4.97       3.15       2.21       1.90       1.67       1.14       1.10         56.80       11.20       2.21       2.21       1.20 <td>34.63 37.80 40.97 44.13 47.30 50.47 53.63</td> <td>7.03</td> <td>┡╅╌╂╌╁</td> <td><del>╿╌</del>┩╾┩╼╂┈</td> <td>1.61 1.74 1.88 2.02 2.16 2.30</td> <td>1.25 1.36 1.47 1.59</td> <td>1.10 1.20 1.30 1.39</td> <td>1.03</td> <td>.800 .867</td> <td>. 757</td> <td></td>	34.63 37.80 40.97 44.13 47.30 50.47 53.63	7.03	┡╅╌╂╌╁	<del>╿╌</del> ┩╾┩╼╂┈	1.61 1.74 1.88 2.02 2.16 2.30	1.25 1.36 1.47 1.59	1.10 1.20 1.30 1.39	1.03	.800 .867	. 757	
37.80       7.66       3.76       2.40       1.74       1.36       1.20       1.03       .867         40.97       8.29       4.06       2.59       1.88       1.47       1.30       1.12       .937         44.13       8.29       4.06       2.59       1.88       1.47       1.30       1.12       .937         44.13       8.29       4.56       2.98       2.16       1.49       1.20       1.09         50.47       10.11       4.97       3.17       2.30       1.60       1.44       1.21         50.47       10.14       4.97       3.17       2.43       1.90       1.67       1.44       1.21         50.40       11.42       5.57       3.36       2.43       1.90       1.67       1.44       1.21         50.80       11.42       5.57       3.36       2.43       1.90       1.67       1.41       1.21         50.80       11.22       5.87       2.57       2.01       1.76       1.52       1.27         66.18       3.93       2.84       2.21       1.84       1.64       4.13       3.12       2.22       1.91       1.61         66.29       13.30 <td>37.80 40.97 44.13 47.30 50.47 53.63</td> <td></td> <td>┝╼╄╍┼</td> <td></td> <td>1.74 1.88 2.02 2.16 2.30</td> <td>1.36 1.47 1.59</td> <td>1.20 1.30 1.39</td> <td>1.03</td> <td>.867</td> <td>.700 .</td> <td></td>	37.80 40.97 44.13 47.30 50.47 53.63		┝╼╄╍┼		1.74 1.88 2.02 2.16 2.30	1.36 1.47 1.59	1.20 1.30 1.39	1.03	.867	.700 .	
40.97       8.29       4.06       2.59       1.88       1.47       1.13       1.12       .937         44.13       8.92       4.36       2.78       2.02       1.59       1.39       1.20       1.07         47.30       9.55       4.67       2.98       2.16       1.70       1.49       1.36         53.67       10.13       4.97       3.17       2.91       1.80       1.58       1.36       1.14         53.63       10.80       5.27       3.36       2.43       1.90       1.67       1.44       1.21         56.80       11.42       5.57       3.55       2.57       2.01       1.76       1.52       1.27         49.97       12.04       5.87       3.74       2.70       2.11       1.84       1.60       1.34         66.29       13.30       6.48       4.13       2.98       2.22       1.91       1.61         66.29       13.30       6.48       4.51       3.26       2.53       2.04       1.76       1.47         66.29       13.30       6.48       4.51       3.26       2.53       2.21       1.91       1.61         75.76       15.76       15.70<	40.97 44.13 47.30 50.47 53.63	99./	<b>-</b> -∔	<del>┞╸</del> ┤╶┥	1.88 2.02 2.16 2.30	1.47	1.30	1.12		.757	
44.13     8,92     4.36     2.78     2.02     1.59     1.39     1.20     1.00       47.30     9,55     4,67     2.98     2.16     1.70     1.49     1.29     1.08       47.30     9,55     4,67     2.98     2.16     1.70     1.49     1.29     1.08       53.63     10.80     5.27     3.36     2.43     1.90     1.67     1.44     1.21       58.80     11.44     5.57     3.75     2.57     2.01     1.84     1.60     1.34       66.29     12.04     5.57     3.74     2.21     1.94     1.68     1.41       66.29     13.30     6.48     4.13     2.98     2.32     2.04     1.76     1.54       69.45     13.93     2.84     2.21     1.94     1.68     1.41       66.29     13.30     6.48     4.13     2.98     2.32     2.04     1.76     1.54       72.60     14.57     7.09     4.51     3.26     2.53     2.21     1.94     1.68       75.76     15.27     7.59     4.90     3.53     2.74     2.51     1.91     1.61       82.23     17.06     4.51     3.95     3.05     2.68     2.31 <td>44.13 47.30 50.47 53.63</td> <td>8.29</td> <td>ļ</td> <td>-</td> <td>2.02 2.16 2.30</td> <td>1.59</td> <td>1.39</td> <td>1 20</td> <td>.937</td> <td>813</td> <td></td>	44.13 47.30 50.47 53.63	8.29	ļ	-	2.02 2.16 2.30	1.59	1.39	1 20	.937	813	
47.30       9.55       4.67       2.98       2.16       1.70       1.49       1.29       1.08         50.47       10.17       4.97       3.17       2.30       1.80       1.58       1.36       1.14         53.63       10.86       5.27       3.36       2.43       1.90       1.67       1.44       1.21         56.80       11.42       5.57       3.55       2.57       2.01       1.76       1.57         6.3.91       12.04       5.87       3.74       2.70       2.11       1.84       1.60       1.34         66.29       13.36       6.48       4.13       2.98       2.32       2.04       1.76       1.47         69.45       13.36       6.48       4.13       2.98       2.32       2.04       1.54       1.64         72.60       14.57       7.09       4.51       3.26       2.53       2.21       1.91       1.61         75.76       15.27       7.09       4.51       3.26       2.53       2.21       1.91       1.61         78.92       15.76       4.50       3.53       2.74       2.59       2.23       1.88         88.39       17.70       8.6	47.30 50.47 53.63	8.92	_	╀	2.16			71.1	1.07		_
50.47       10.17       4.97       3.17       2.30       1.80       1.58       1.36       1.14       1.21         53.63       10.86       5.27       3.36       2.43       1.90       1.67       1.44       1.21         56.80       11.42       5.57       3.55       2.57       2.01       1.76       1.52       1.27         49.97       12.04       5.87       3.74       2.70       2.11       1.84       1.60       1.34         66.29       13.33       6.48       4.33       2.84       2.21       1.76       1.56       1.47         66.29       13.93       6.48       4.31       3.26       2.32       2.04       1.76       1.47         66.29       13.93       6.48       4.31       3.26       2.22       2.11       1.61       1.47         72.60       14.57       7.09       4.51       3.26       2.52       1.91       1.61         75.76       15.20       7.39       4.70       3.39       2.63       2.31       1.99       1.68         82.23       17.06       8.30       5.29       3.67       2.84       2.89       2.23       1.14         85.23	50.47	1	┝		2.30			1.29	1.08	.870	
53.63   10.86   5.27   3.36   2.43   1.90   1.67   1.44   1.21     56.80	53.63	1	╁┈	⊢	د // د	1.80	1.58	1.36	1.14	.923	-
56.80     11.42     5.57     3.54     2.57     2.01     1.76     1.52     1.27       49.97     12.04     5.87     3.74     2.70     2.11     1.84     1.60     1.34       66.29     13.30     6.48     4.13     2.84     2.21     1.94     1.68     1.41       66.29     13.30     6.48     4.13     2.84     2.32     2.04     1.76     1.47       69.45     13.93     6.78     4.32     3.12     2.24     2.13     1.84     1.54       72.60     14.57     7.09     4.51     3.26     2.53     2.21     1.91     1.61       75.76     15.20     7.39     4.70     3.39     2.63     2.31     1.99     1.68       75.76     15.20     7.59     4.90     3.53     2.74     2.41     2.07     1.81       82.07     16.46     7.99     5.09     3.67     2.94     2.50     2.23     1.94       85.23     17.06     8.50     5.47     3.95     3.05     2.84     2.39     2.31     1.94       94.70     18.99     9.20     5.66     4.22     3.27     2.87     2.47     2.01       1     1     1     <		10.80	-	<u> </u>	1 (1.7	1.90	1.67	1.44	1.21	776.	
49.97       12.04       5.87       3.74       2.70       2.11       1.84       1.60       1.34         63.13       12.67       6.18       3.93       2.84       2.21       1.94       1.68       1.41         66.29       13.30       6.48       4.13       2.98       2.32       2.04       1.76       1.47         69.45       13.93       6.78       4.32       3.12       2.24       2.13       1.34       1.54         72.60       14.57       7.09       4.51       3.26       2.53       2.22       1.91       1.61         75.76       15.20       7.39       4.70       3.39       2.63       2.41       2.07       1.68         78.20       15.81       7.69       4.90       3.53       2.74       2.41       2.07       1.74         82.07       16.46       7.99       5.09       3.67       2.84       2.50       2.15       1.88         88.39       17.70       8.60       5.66       4.08       3.16       2.78       2.31       1.94         94.70       18.99       9.20       5.85       4.22       3.27       2.87       2.47       2.08         1 <td>56.80</td> <td>1</td> <td>L</td> <td>┝</td> <td>2.57</td> <td>2.01</td> <td>1.76</td> <td>1.52</td> <td>1.27</td> <td>1.03</td> <td></td>	56.80	1	L	┝	2.57	2.01	1.76	1.52	1.27	1.03	
63.13 12.67 6.18 3.93 2.84 2.21 1.94 1.68 i.41 66.29 13.30 6.48 4.13 2.98 2.32 2.04 1.76 1.47 69.45 13.93 6.78 4.32 3.12 2.24 2.13 1.84 1.54 72.60 14.57 7.09 4.51 3.26 2.53 2.22 1.91 1.61 75.76 15.27 7.09 4.70 3.39 2.63 2.31 1.99 1.68 78.92 15.83 7.69 4.90 3.53 2.74 2.41 2.07 1.74 82.07 16.46 7.99 5.09 3.67 2.84 2.50 2.15 1.81 85.23 17.06 8.30 5.28 3.81 2.95 2.59 2.23 1.88 88.39 17.70 8.60 5.47 3.95 3.05 2.69 2.31 1.94 94.70 18.99 9.20 5.66 4.08 3.16 2.78 2.30 2.01 94.70 18.99 9.20 5.85 4.22 3.27 2.87 2.47 2.08	16.64			_	2.70	2.11	1.84	1.60	1.34	1.09	
66.29 13.36 6.48 4.13 2.98 2.32 2.04 1.76 1.47 69.45 13.93 6.78 4.32 3.12 2.24 2.13 1.34 1.54 72.60 14.57 7.09 4.51 3.26 2.53 2.22 1.91 1.61 75.76 15.20 7.39 4.70 3.39 2.63 2.31 1.99 1.68 78.92 15.83 7.69 4.90 3.53 2.74 2.41 2.07 1.74 82.07 16.46 7.99 5.09 3.67 2.84 2.50 2.15 1.81 85.23 17.06 8.30 5.28 3.81 2.95 2.59 2.23 1.88 88.39 17.70 8.60 5.47 3.95 3.05 2.68 2.31 1.94 91.54 18.33 8.90 5.66 4.08 3.16 2.78 2.30 2.01 91.54 18.39 9.20 5.85 4.22 3.27 2.87 2.30  D = 3.0  T = Time on unmodified T = Tablures on unmodified T = Tablures on unmodified T = Tablures on unmodified	63.13		_	$\dashv$	2.84	2.21	1.8	1.68	i.41	1.14	
69.45       13.93       6.78       4.32       3.12       2.24       2.13       1.34       11.54         72.60       14.57       7.09       4.51       3.26       2.53       2.22       1.91       1.61         75.76       15.20       7.39       4.70       3.39       2.63       2.31       1.99       1.68         78.92       15.83       7.69       4.90       3.53       2.74       2.41       2.07       1.74         82.07       16.46       7.99       5.09       3.67       2.84       2.50       2.15       1.81         88.39       17.06       8.30       5.28       3.81       2.95       2.59       2.21       1.86         91.54       18.33       8.90       5.66       4.08       3.16       2.78       2.31       1.94         94.70       18.39       9.20       5.85       4.22       3.27       2.47       2.08         1       1.3 Failures on modified       1.2 Time on unmodified       1.2 Time on unmodified       1.2 Time on unmodified         1       1.2 Failures on unmodified       1.2 Time on unmodified       1.2 Time on unmodified	66.29	13.30	Щ	.13	2.98	2.32	2.0¢	1.76	1.47	1.19	
72.60 14.57 7.09 4.51 3.26 2.53 2.22 1.91 1.61 75.76 15.20 7.39 4.70 3.39 2.63 2.31 1.99 1.68 78.92 15.83 7.69 4.90 3.53 2.74 2.41 2.07 1.74 82.07 16.46 7.99 5.09 3.67 2.84 2.50 2.15 1.81 85.23 17.08 8.30 5.28 3.81 2.95 2.59 2.23 1.88 88.39 17.70 8.60 5.47 3.95 3.05 2.68 2.31 1.94 91.54 18.33 8.90 5.66 4.08 3.16 2.78 2.39 2.01 94.70 18.99 9.20 5.85 4.22 3.27 2.87 2.47 2.08   D = 3.0  T = Time on unmodified  T = Time on unmodified  T = Failures on unmodified  T = Time on unmodified	69.45	13.93	_	.32	3.12	2.24	2.13	1.%	1.54	1.25	
75.76 15.20 7.39 4.70 3.39 2.63 2.31 1.99 1.68 78.92 15.83 7.69 4.90 3.53 2.74 2.41 2.07 1.74 82.07 16.46 7.99 5.09 3.67 2.84 2.50 2.15 1.81 85.23 17.06 8.30 5.28 3.81 2.95 2.59 2.23 1.88 88.39 17.70 8.60 5.47 3.95 3.05 2.69 2.31 1.94 91.54 18.33 8.90 5.56 4.08 3.16 2.78 2.39 2.01 94.70 18.99 9.20 5.85 4.22 3.27 2.87 2.47 2.08   D = 3.0  T = Time on unmodified  T = Time on unmodified  T = Failures on unmodified  T = Time on unmodified  T = Time on unmodified	72.60	14.57		.51	3.26	2.53	2.22	1.91	1.61	1.30	
78.92     15.83     7.69     4.90     3.53     2.74     2.41     2.07     1.74       82.07     16.46     7.99     5.09     3.67     2.84     2.50     2.15     1.81       85.23     17.06     8.30     5.28     3.81     2.95     2.59     2.23     1.88       88.39     17.70     8.60     5.47     3.95     3.05     2.68     2.31     1.94       91.54     18.95     9.20     5.85     4.22     3.27     2.87     2.47     2.08       94.70     18.95     9.20     5.85     4.22     3.27     2.87     2.47     2.08       r     r     = 3.0     r     T     = Time on unmodified       r     r     = Failures on unmodified     T     T     = Time on unmodified       r     r     = Failures on unmodified     T     = Time on unmodified	75.76	15.20		70	3.39	2.63	2.31	1.99	1.68	1.36	
82.07 16.46 7.99 5.09 3.67 2.84 2.50 2.15 1.81 85.23 17.08 8.30 5.28 3.81 2.95 2.59 2.23 1.88 88.39 17.70 8.60 5.47 3.95 3.05 2.68 2.31 1.94 94.70 18.99 9.20 5.85 4.22 3.27 2.87 2.47 2.08  D = 3.0  T = Time on unmodified	78.92	15.83	69.		٠!	2.74	2.41	2.07	1.74	1.41	
88.39 17.08 8.30 5.28 3.81 2.95 2.59 2.23 1.88 1.  88.39 17.70 8.60 5.47 3.95 3.05 2.68 2.31 1.94 1.  91.54 18.33 8.90 5.56 4.08 3.16 2.78 2.39 2.01 1.  94.70 18.99 9.20 5.85 4.22 3.27 2.87 2.47 2.08 1.  T = Time on modified	82.07	16.46	- 66	$\dashv$	3.67	2. %	2.50	2.15	1.81	1.46	
88.39 17.70 8.60 5.47 3.95 3.05 2.68 2.31 1.94 1. 91.54 18.33 8.90 5.56 4.08 3.16 2.78 2.39 2.01 1. 94.70 18.99 9.20 5.85 4.22 3.27 2.87 2.47 2.08 1.  D = 3.0  T = Time on unmodified	85.23	17.08		-	3.81	2.95	2.59	2.23	1.88	1.52	
91.54 18.33 8.90 5.56 4.08 3.16 2.78 2.39 2.01 1. 94.70 18.99 9.20 5.85 4.22 3.27 2.87 2.47 2.08 1.  D = 3.0  T = Time on modified  r = Failures on unmodified  T = Time on unmodified	88.39	17.70		$\dashv$	3.95	3.05	2.68	2.31	1.94	1.57	
94.70 18.99 9.20 5.85 4.22 3.27 2.87 2.47 2.08 1.  D = 3.0 $r_1^1$ = Failures on unmodified $r_2^1$ = Failures on unmodified  The on unmodified To a serious of the contract of the contrac	45.16	18.33	.90		•	•	2.78	•	2.01	1.63	
r] = Failures on modified r] = Time on r2 = Failures on unmodified r2 = Time on r2 = Table 3: REJECT CRITERIA	94.70	18.95		.85	•	-1	2.87	• •	2.08	l •1	
= Failures on modified T2 = Time on = Failures on unmodified TABLE 3: REJECT CRITERIA	D = 3.0		•	-	- " [-			fied			
Failures on unmodified TABLE 3: REJECT CRITERIA	!!		n modif	ied	, ,	Time		diffed			
TABLE 3: REJECT	1			ified	-2			3 ) (			+
3: REJECT										+	
				••		TERIA					+

 $\mathbf{z}_{i} = \mathbf{z}_{i} + \mathbf{z}_{i}$ 

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#### 3.0 TEST CONFIGURATION AND PROCEDURES

#### 3.1 TEST LOCATION/EQUIPMENT

The test will be conducted by OOAMA/MMETAW in building S-882 at Hill Air Force Base, Utah. The reliability test chamber to be used is a Thermotron model F-144-CHV-25-25-25 incorporating a model 211 Marshall vibration unit.

#### 3.2 TEST SPECIMENS AND INSTALLATION

The test specimens consist of four (4) modified and three (3) unmodified ICUs. Three modified and three unmodified specimens will be mounted on a vibration table, in a temperature chamber, including all mechanical and electrical connections required to operate/monitor the specimens. The specimens will be mounted on the vibration table such that one of the modified and unmodified units is oriented in each of three rectangular axes (see Figure 2). No external environmental air shall be generated to the test specimens during the test.

#### 3.3 <u>TEST PROCEDURES</u>

The following procedures shall be utilized to monitor the test specimens during the "on-time" portion of the test cycle. The complete procedure shall be accomplished at least once during each fifteen (15) minutes of equipment "on-time". Each IGU shall be checked by setting switch positions on the control consoles and verifying that the symbols displayed on the radar indicators are within the specifications shown on the indicator scope overlays and verified on the test check-off sheet. The time when each check is accomplished shall be recorded. These procedures are in accordance with applicable technical orders and test specifications and have been approved by OOAMA/MMETAW, MMEEA, and MMERR.

#### (1) Power Application

- a. Power Cart ON
- b. Power Supplies ON
- c. Master Switch ON
- d. Input Supplies Verify Voltages
- e. Indicator Switch ON
- f. Delay Switch ON after 30 secs.
- g. ICU Power ON
- h. ICU Signal ON
- i. 1CU Selector Verify normal display on all six positions (leave on #6)

#### (2) Mode Switching Panel

- a. AI RDR, MAP-B, BST ON
- b. BIT #3 ON
- c. 25 Mile ON
- d. Acquisition ON
- e. Range Lock ON
- f. Track Display ON
- (3) Verify that symbols are within tolerances as outlined on overlay #1 and check on test check-off sheat.
- (4) Verify that symbols are within tolerance as outlined on overlay #2 and check on test check-off sheet.
- (5) Set Mode Switching Panel to each range setting and verify range switching results per test check-off sheet.
- (6) Set Mode Switching Panel on each of the following positions and verify results per test check-off sheet.

- a. STAB OUT
- b. BREAK X
- c. EXPANDED SWEEP
- (7) Rotate the ICU Selector through the remaining five positions and repeat steps (3) through (6) for each of the ICUs.

#### 4.0 THERMAL/VIBRATION SURVEY

#### 4.1 THERMAL SURVEY

A thermal survey shall be made of the equipment to be tested, under test level temperature cycling prior to the initiation of testing. The purpose of this survey is to identify the component of greatest thermal inertia and to establish the time temperature relationship between it and the chamber air. This relationship shall be used to determine the thermal stabilization of the equipment during the test. The lower test level temperature stabilization takes place when the temperature of the point of maximum thermal inertia is within 2°C of the lower tes. level temperature and its rate of change is less than 2°C/hour. Upper test level temperature stabilization takes place when the rate of change of the point of maximum thermal inertia at the upper temperature limit is less than 2°C/hour. The techniques and results of the thermal survey shall be described by MMETAW and submitted to MMERR. shall be run according to the approved procedures. Temperatures of the heating-cooling air shall be recorded continuously during both survey and testing.

#### 4.2 <u>VIBRATION SURVEY</u>

A vibration survey shall be conducted over the frequency range of 20 to 60 Hz. A nonresonant frequency selected in this range will be used in performing vibration during the Reliability Test. A strobe light will be used to verify that resonant modes are not present. The techniques and results of the vibration survey shall be described by MMETAW and submitted to MMERR.

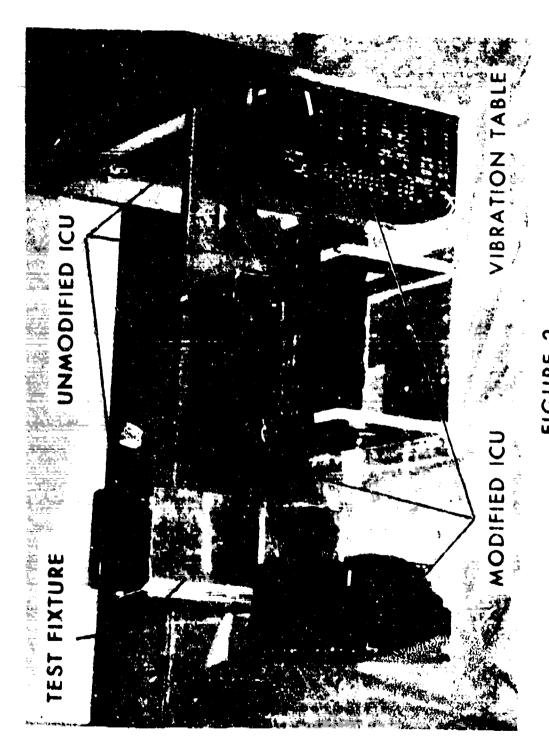


FIGURE 2 TEST SPECIMEN SETUP

#### 5.0 TEST DATA REPORTING

## 5.1 TEST INSTRUMENTATION REQUIREMENTS

Provisions shall be made to determine that the test specimen inputs are within tolerances (see paragraph 2.2(5)) and that the specimen outputs are within limits as specified in the applicable documents.

The chamber temperature shall be monitored and recorded continuously during the test.

#### 5.1.1 INPUT REQUIREMENTS

The following inputs are required for each specimen on test.

- (1) Phase A, B, and C power.
- (2) B+ DC power.
- (3) 28VDC power.
- (4) A-Gun inputs
- (5) B-Gun inputs

#### 5.1.2 OUT REQUIREMENTS

The following outputs will be monitored for each specimen on test.

- (1) Range Rate Circle
- (2) ASE Circle.
- (3) Aim dot.
- (4) Horizon Line
- (5) Elevation Strobe
- (6) Maximum Range Strobe
- (7) Minimum Range Strobe
- (8) B Sweep
- (9) Acquisition Symbol
- (10) Range Rate Gap

#### 5.2 ENGINEERING TEST PROJECT LOG

An Operational Information Log shall be maintained during all operations of the test specimens. This log shall be used to record elapsed time readings, operating time, accumulated time and signature of observer.

Remarks shall be included which record significant events or notes applicable to the periods of operation. Figure 3 is the Engineering Test Project Log that will be used.

#### 5.3 FAILURE REPORTING

Whenever a discrepancy occurs, a failure report shall be initiated to record the event and describe the discrepancy. A failure analysis report shall be initiated following analysis and ultimate resolution of the problem. Figures 4 and 5, respectively, are the Item Failure and Failure Analysis Reports.

#### 5.4 FAILURE CRITERIA

During this reliability test, the failure criteria of MIL-STD-721B as clarified/amplified in this test plan shall apply. A failure is defined as any catastrophic cessation of function in any part of the test specimens or any degradation such that the related performance cannot be maintained within the specified tolerances.

#### 5.4.1 RELEVANT FAILURE CRITERIA

A relevant failure is any verified failure, as defined above, that cannot be classified as a nonrelevant failure in accordance with the criteria of paragraph 5.4.2.

In the event that a discrepancy is noted for which there is no set failure criteria, that discrepancy will be recorded in the test log along with

		ERING TEST PROJECT LOG PAGE OF	PAGE
TYPE TES		E. EQUIPMENT TESTED	
DATE	TIME	COMMENTS/ACTION C	INITIALS
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# TP-MMER/RM - 72 - 108

ITEM	FAILURE REPO	RT	1. Report Number			
2. Failed Part Name	3. Failed P/N	4. Serial No.	5. Mígr.			
	6. MOD No.	7. Appl. TCTO/ECP	8. Project No.			
9. Next Higher Assy	10. NHA P/N	11. NHA S/N	12. Mígr.			
13. System	14. System S/N	15. Model	16. Follow-up Rpt No.			
17. Failure Discovere  Thermal Survey Vibration Survey Repair Verif. Reliability Demo. Other	d During (Check)	18. Test Location	19. Test Plan			
20. PAILURE DESCR	iption, preliminary	DIAGNOSIS, TEST CON				
21. Cause of Failure of	r Stress(Check)	22. Disposition	23. Operating Time			
☐ Assembly ☐ Part ☐ Material ☐ Test Equip.	☐ Design ☐ Other	24. Fail Date	25. Time			
26. 27.	28. Reported By	AILURE REPORT	29. Page Of			

# TP-MMER/RM - 72 - 108

FAILUR	FAILURE ANALYSES REPORT							
2. Failed Part Name	3. Failed P/N	4. Serial No.	5. Failure Date					
	6. MOD No.	7. Mfgr	8. Failure Rpt No.					
9. Next Higher Assy	10. NHA P/N	11. NHA <b>S</b> /N	12. Project No.					
13. System	14. System S/N	15. Model	16. NHA Mígr					
17. Cause of Failure (	Other FAILURE	Stress Causing Da   Electrical   Mechanical   Pressure   Temperature   Humidity   Overload	mage (Check)					
22. Analyzed By		23. Date	24. Page Of					

FIGURE 5: FAILURE ANALYSIS REPORT

related information and corrective actions required. MMETAW, MMEEA, and MMERR personnel will then review the test log data and determine whether the discrepancy should be classified as a relevant or nonrelevant failure.

#### 5.4.2 NON RELEVANT FAILURE CRITERIA

A failure of a test specimen caused by a condition external to the system under test which is not a test requirement and not encountered in actual service shall be classified as nonrelevant. The following list itemizes causes of failures which shall be classified nonrelevant. Nonrelevant failures shall not be used for the establishment of the formal accept/reject decision.

- (1) Failures caused by human error of test personnel (e.g. positioning of switch incorrectly during test).
- (2) Failures caused by malfunctions of test equipment or the test facility.
- (3) Failures of any interconnecting item, such as wiring harnesses used in testing, which is not a part or component of normal equipment configuration in service applications.
- (4) Failures which occur as a result of operation of the equipment in excess of specification limits, such as the application of excessive external voltages, loads, acceleration, and shock.
- (5) A non-recurring phantom failure is indicated on test monitoring equipment which cannot be subsequently verified.
- (6) Failures of the indicator lights and fuses.
- (7) Failures occurring in the specimens during fault isolation, provided the time of operation of the equipment is not counted.

(8) Failures occurring during the repair verification portion of
the test cycle after reinstatement into the chamber. The time of
operating during this period shall contribute to e total
only if a failure does not occur.

#### 6.0 TEST OBJECTIVES AND EVALUATION

#### 6.1 TEST OBJECTIVES

The primary test objectives are:

- (1) Verify the reliability improvement factor for the proposed modification.
- (2) Determine a reliability baseline, under the conditions of this test plan, for the modified and unmodified ICUs.

## 6.2 <u>EVALUATION CRITERIA</u>

The evaluation criteria will be as follows:

- (1) The determination of the outcome of paragraph 6.1(1) above will be in accordance with paragraph 2.3 of this test plan.
- (2) The determination of the values associated with paragraph 6.1(2) above will be accomplished using the Chi-Square distribution for confidence.

#### 7.0 RELIABILITY TEST REPORT

## 7.1 <u>TEST REPORT PREPARATION</u>

The results of the reliability test conducted on the C-4453 Indicator Control Unit will be contained in a final test report compiled by MMERR.

## 7.2 <u>TEST\_REPORT\_CONTENTS</u>

The test of the final report will contain the following information:

- a. Test objectives
- b. Brief statement of tests conducted in support of test objectives
- c. Test configuration, including equipment, facilities and procedures
- d. Brief statement of test results
- e. Test evaluation
- f. Problems encountered
- g. Recommendations/conclusions
- h. Test data (graphs, charts, tabulation)

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